

Managing Runway Incursions with Data



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Presentation Overview

- What does data collection and analysis have to do with managing risk?
- A top-down overview of runway incursion incident data requirements
- Current AIRPROX investigation methods and results
- The way ahead?

Do Safety Problems Start at Pushback from the Gate?



Risk Management and the Role of Data Collection and Analysis

- What are our obligations for managing risk?
- Legal criminal requirement for most countries for public transport operators and infrastructure providers
- Aviation safety regulatory requirement from ICAO put into national legislation
- We are a “safety first” operational system (public statements)
- Public and government expectation that aviation is “acceptably safe”

“Pants (English trousers) are more dangerous than Aircraft”

- In the last five years in the United Kingdom, more people have been killed by falling over and sustaining fatal head injuries whilst putting on pants than have been killed in commercial aviation in UK registered aircraft.

Risk Management and the Role of Data Collection and Analysis

- The risk must be managed to be “As Low As Reasonably Practicable” (ALARP)
- Four requirements
 - Risk must be limited
 - Risk must be optimized
 - Risk must be justified
 - Risk must be monitored

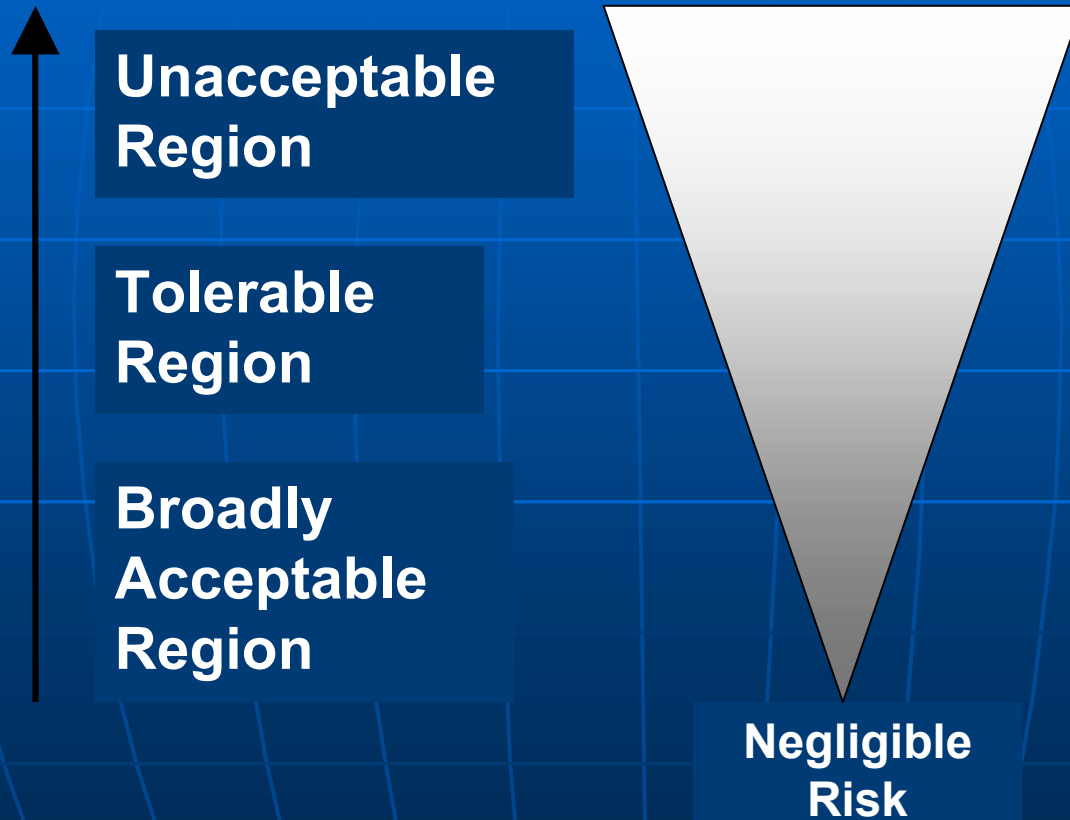
Risk Limitation

- The risk must be limited at or below the target level of safety
- Target level of safety
- Average risk exposure level
- Peak to average ratio
- Exposed population
- What is your target level of safety?
- How can you make decisions about acceptability without one?

Risk Optimisation

- The risk must be optimised, but what does this mean?
- Identification of risk reduction concepts
- Analysis of risk reduction benefit, cost, timescales to implement, probability of success, mutual interaction
- Comparison with corporate risk optimisation criteria
- Do you have such corporate criteria?

Tolerability of Risk



Risk Justification

- The reason that the company has decided that the risk exposure is reasonable must be documented
- The document must be available for examination
- Logical philosophy based arguments
- Conclusions of what has to be done to make the system safe in accordance with ALARP

Exposed Population Data

CBS News 12/21/2002

35 percent of all serious household accidents occur in the bathroom.



Risk Logic

- We were a government organization
- The government would never do anything unsafe
- We have not changed anything since corporatization
- Therefore, we must be safe.

Risk Monitoring

- The organization must learn from its own events
- The organization must learn from events elsewhere in the world
- What does that imply?

Risk Monitoring

- Define events to be investigated
- Tell staff which events to report
- Have a defined process for reporting
- Train the investigators
- Apply the process
- Determine the event sequence
- Apply risk optimisation to determine recommendations
- Act on the recommendations!

Which Events to Report?



Investigation Findings

- Collision on a runway at night around 23:59 local time 24 December
- One aircraft totally destroyed, one minor damage
- One death of a crew member
- Major psychological trauma for millions of children
- 8 missing animals

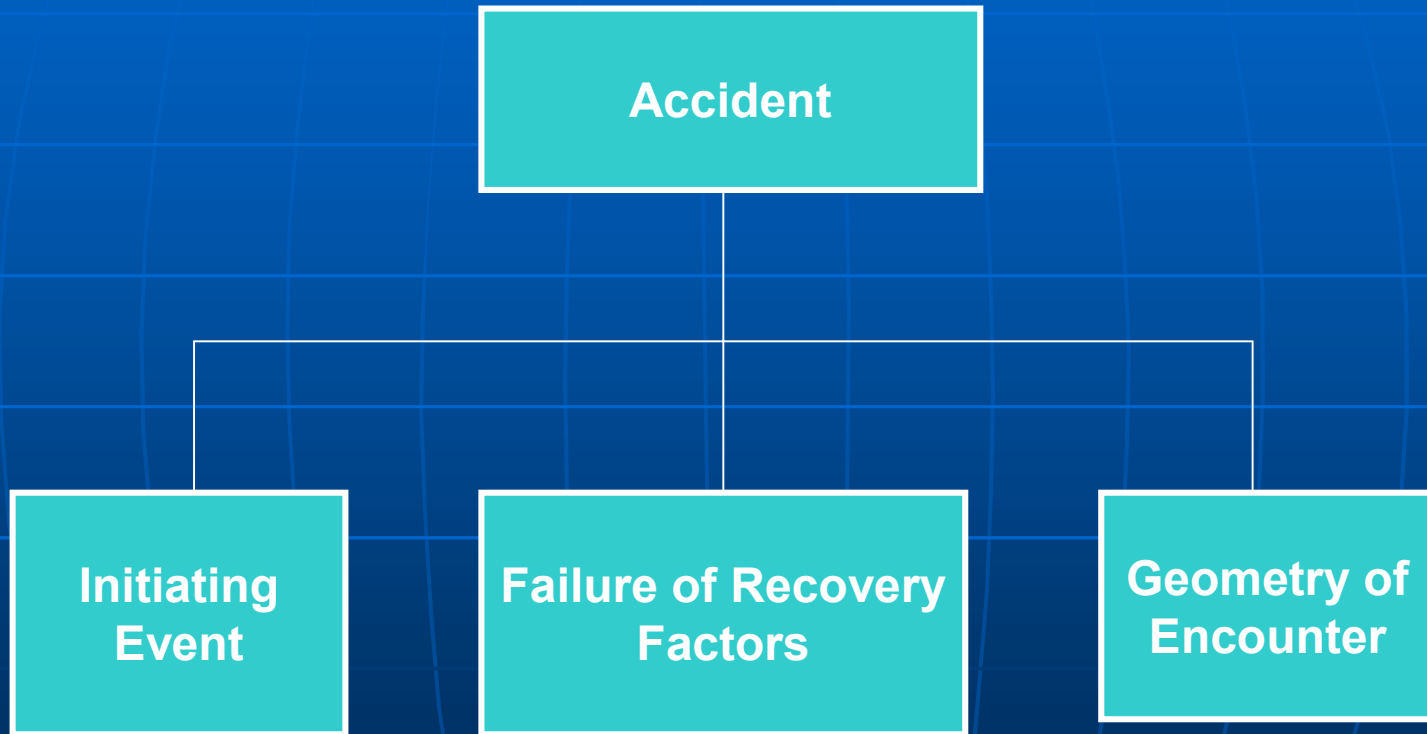
Event Investigation

- One aircraft operating VFR with no flight plan
- Did not call ATC for clearance
- Collision at night
- Only one red anti-collision steady not flashing light fitted
 - steady Rudolph type
- 737 crew and controller did not spot the potential collision

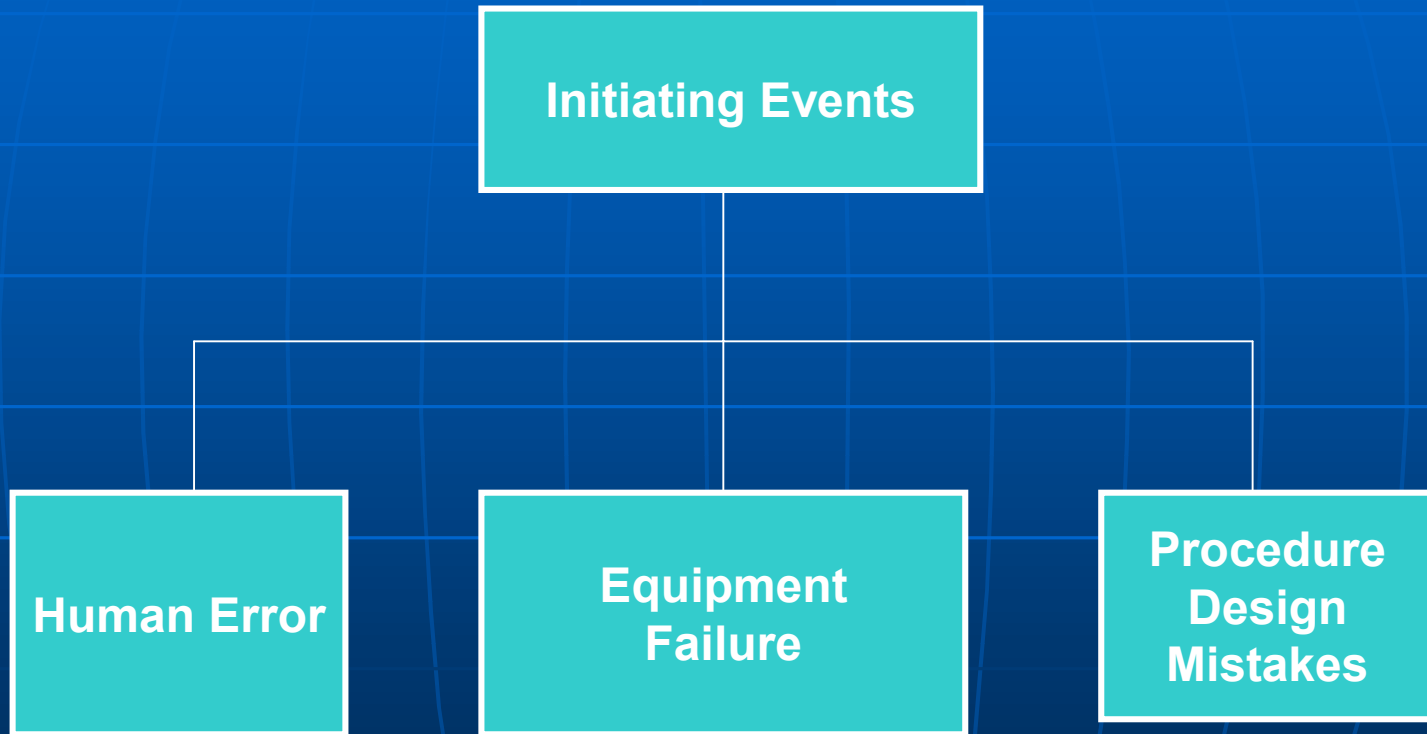
Investigation Conclusions

- Hazard identification did not show this as a high risk event
 - Only one flight a year by VFR type
 - Not in database as having occurred before
- VFR pilot had no license and aircraft no Certificate of Airworthiness
- Recommend additional controller training

Risk Assessment based “Reasonistic” Accident Model



Initiating Event of Accident Sequence



Runway Incursion Data

- What data is required?
- First must define the events of interest:
- What are the initiating events, irrespective of recovery and geometry
- What could stop an initiating event leading to an incursion?
- What are the recovery factors once an incursion has occurred?

Bottom Up Design Process



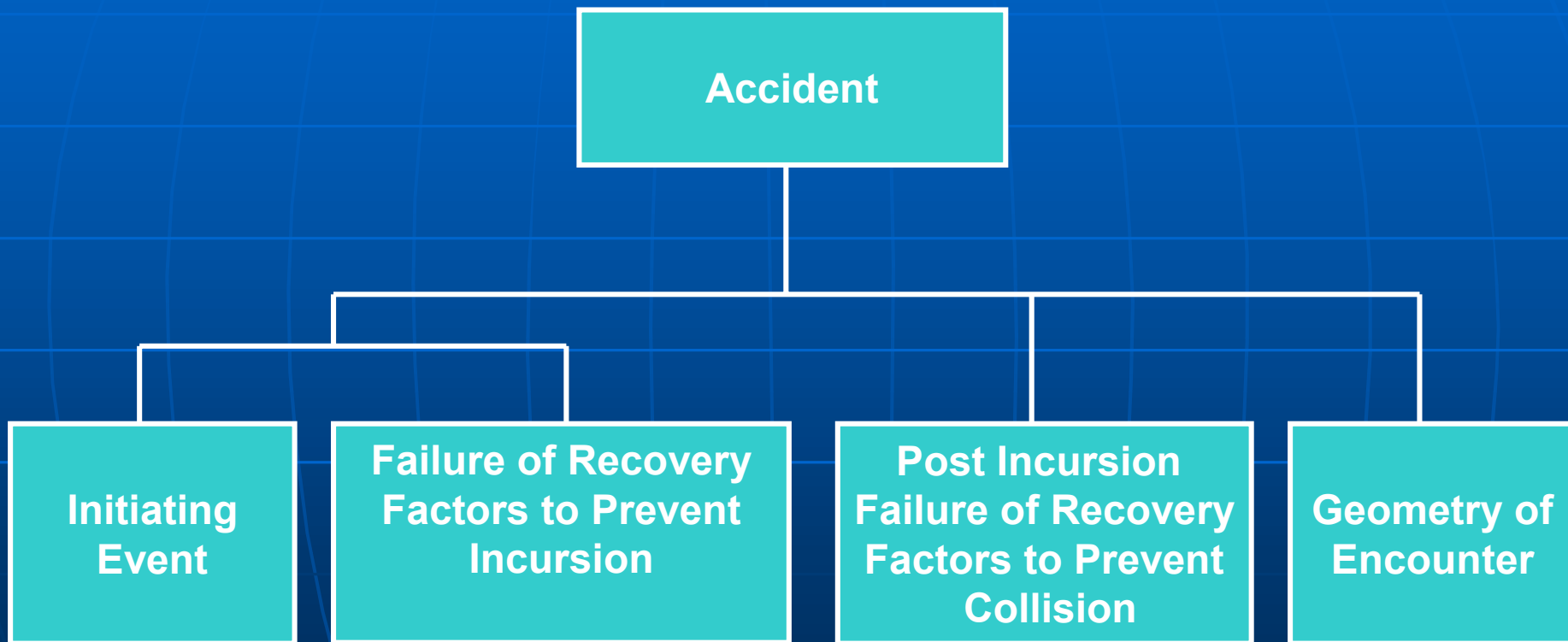
Initiating Events

- A set of events whereby a controller, pilot, driver, equipment or procedure could allow an incursion onto a runway
 - Pilot thinks that aircraft cleared onto runway
 - Controller makes planning mistake
 - Driver gets lost
 - Software failure in Addressable Lighting System

Unusual Airport Designs



“Reasonistic” Runway Incursion Accident Model



Recovery Factors

- Controller becomes aware of incursion and plans a resolution
- Pilot “see and avoid” or on-board warning system alerts pilots

Run Video Now

Tenerife 1977



Geometry of Encounter

- Size of the aircraft
- Speed of the aircraft
- Any vertical separation possible?
- Why do we cross in the middle of a runway?
- For 30 departures per hour then a 747 crossing in front of a 747 has about a 30% chance of collision geometry overlapping

Geometry of Encounter



Initiating, Causal and Contributory

- Most of our accidents involve several events
- These form a chain which link together (Reason Swiss Cheese)
- However, there are no defined criterion for allocating "severity" to these events
- All judgements about causal or contributory are the investigator's personal (potentially irrational) feelings
- Just consider them as events

What does the data tell us?

- What does the incursion data tell us?
- 1. where should I stop?
- 2. how many people are controlling the traffic on this runway?
- 3. can the runway users see and hear one another?
- 4. can the controllers see who is using the runway?
- 5. can a “stop” be effective in the time available?
- 6. who owns the risk?

Application of Risk Optimization

- “Holding points” must be further back from the runway centreline
- All aircraft and vehicles on same frequency
- Red stopbars must be used H24, daylight visible, high integrity
- No conditional clearances
- Do not cross in the middle
- Runway incursion alarms required

Current AIRPROX Process

- Main criteria are associated with the “risk of collision” A, B, C and D on the day of the event
- No systematic investigation of each event’s likelihood.
- Group of untrained individuals
- Recommendations not developed using risk optimization techniques

The Way Ahead

- Formalise the principles of risk management within the organisation
- Formalise the legal requirements for the Directors and Senior Managers
- Formalise the responsibility of each organization (ATC, airport, aircraft operator, regulator)
- Formalise the responsibility of the staff
- Apply the process to the current operation
- Make the necessary changes

Detroit DC-9 vs 727



737 and Metroliner





I Want A Direct Flight Home!

